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ABSTRACT

The relation of visual process to Piaget's stages of cognitive development was examined. The study utilized four age groups to correspond roughly to acquisition and consolidation periods of concrete and formal operations: 6 years - acquisition of concrete operations; 9 years - consolidation of concrete operations; 11 years - acquisition of formal operations; and 15 years - consolidation of formal operations. Approximately 200 subjects were given a set of visual imagery tests. Then three Piagetian tasks were administered individually to each subject. Correlational analyses and analyses of covariance were performed for each age group. A positive relationship was found between imagery and cognitive tasks for the consolidation groups and was not found for the acquisition groups. (Author/MS)

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The Relation of Visual Imagery to Piaget's Stages of Cognitive Development

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The role of visual process in cognition has received increasing attention in recent years. However, major writers on cognitive development have relegated visual process to the early stages, and have considered that too much reliance on ikonic process can interfere with symbolic, verbal or operational development (Bruner, 1966; Piaget and Inhelder, 1969). A study by Kuhlman (1960; Hollenberg, 1970) supported this point of view, using subjects up to the age of nine years. The present writer developed an alternative hypothesis and conducted a study to test it.

The general hypothesis was as follows. The stages of cognitive development as described by Piaget (1950) can be subdivided into periods of acquisition and consolidation of the new mental structures. During periods of acquisition, high visual process may interfere with other cognitive processes, but during consolidation periods visual process can complement and enhance cognitive functioning. It was assumed that high usage of visual process is a stable individual difference that is unrealted to general intelligence.

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The study utilized four age groups to correspond roughly to acquisition and consolidation periods of concrete and formal operations: six years--acquisition of concrete operations; nine years--consolidation of concrete operations; 11 years--acquisition of formal operations; and 15 years--consolidation of formal operations. Approximately 200 subjects (25 of each sex in each age group) were given a set of "visual imagery" tests used by

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Kuhlman (1960). Then three Piagetian tasks were administered individually to each subject, Displacement and Pendulum Wformal operations tasks) and Perspectives (Piaget's "mountains task"). Correlational analyses and analyses of covariance were performed for each age group. (Covariates were available measures of achievement, including teacher ratings, achievement test scores, and grade point averages.)

Results supported part of the general hypothesis. A positive relationship was found between imagery and cognitive tasks for the consolidation groups (ages 9 and 15), and was not found for the acquisition groups (ages 6 and 11), except that Perspectives was related to imagery for all ages, as had been predicted on the assumption that both measures tap an imagery factor. The results did not indicate any disadvantages for high imagery subjects, in that no negative relationships were found between cognitive tasks and imagery. Table 1 shows the major correlations, and Figure 1 shows cell means from the major analysis of covariance.

When data were divided by sex, the results did not hold up well. Figure 2 illustrates the probable reason. Imagery becomes less predictive of boys' performance on Perspectives at higher grade levels, while for girls, imagery becomes increasingly discriminating of performance on Perspectives at higher grade levels.

A serious limitation of this study was the confounding of age and stage, through the use of certain ages to represent certain periods of acquisition and consolidation, a procedure that no good Piagetian would accept lightly. However, it is probably reasonable to assume that the majority of each age group did, in fact, fall into the assigned periods,

so that the results can be interpreted appropriately under the hypothesis.

The results were clearly in the predicted direction, and seem to support the contention that individual differences can and should be studied within the context of normative stage theory. Future research could investigate such differential factors more carefully. For example, a similar study could use actual stage assignments as the basis for grouping subjects, and then utilize other cognitive measures to compare with imagery scores. One educational application of this approach would be to introduce new cognitive skills during periods of consolidation, when learning may be maximal. It seems clear that individual and sex differences are important variables in cognitive development.

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VISUAL IMAGERY AND PIAGET STAGES
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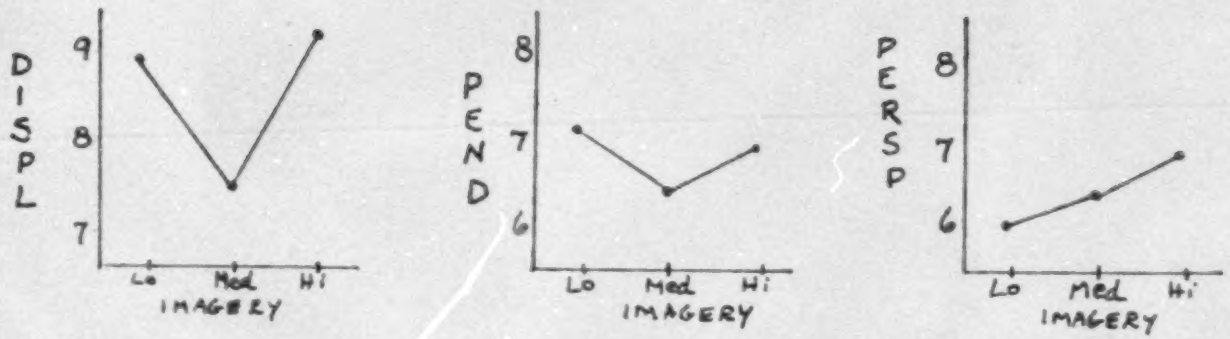
GRADE ONE

GRADE FOUR

FIG. 1. MEAN SCORES ON PIAGET TASKS BY IMAGERY LEVEL.
(FROM ANALYSIS OF COVARIANCE.)

GRADE SIX



GRADE TEN

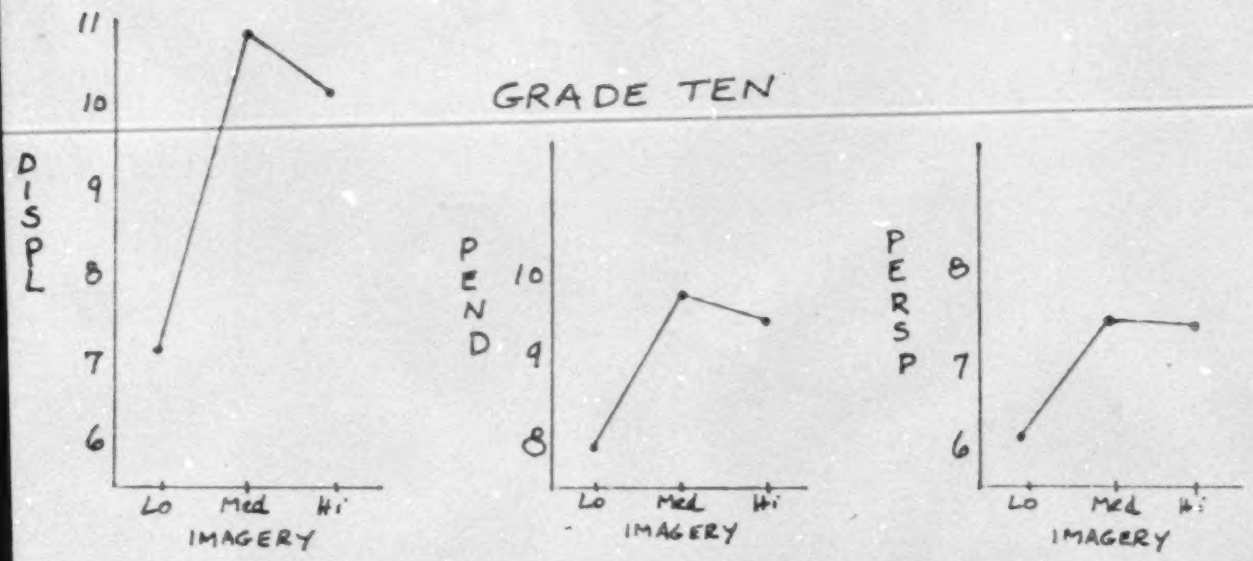


FIG. 1. (CONTINUED)

FIG. 2. MEAN SCORES ON PERSPECTIVES TASK FOR EACH SEX BY IMAGERY LEVEL. (FROM ANALYSIS OF COVARIANCE)

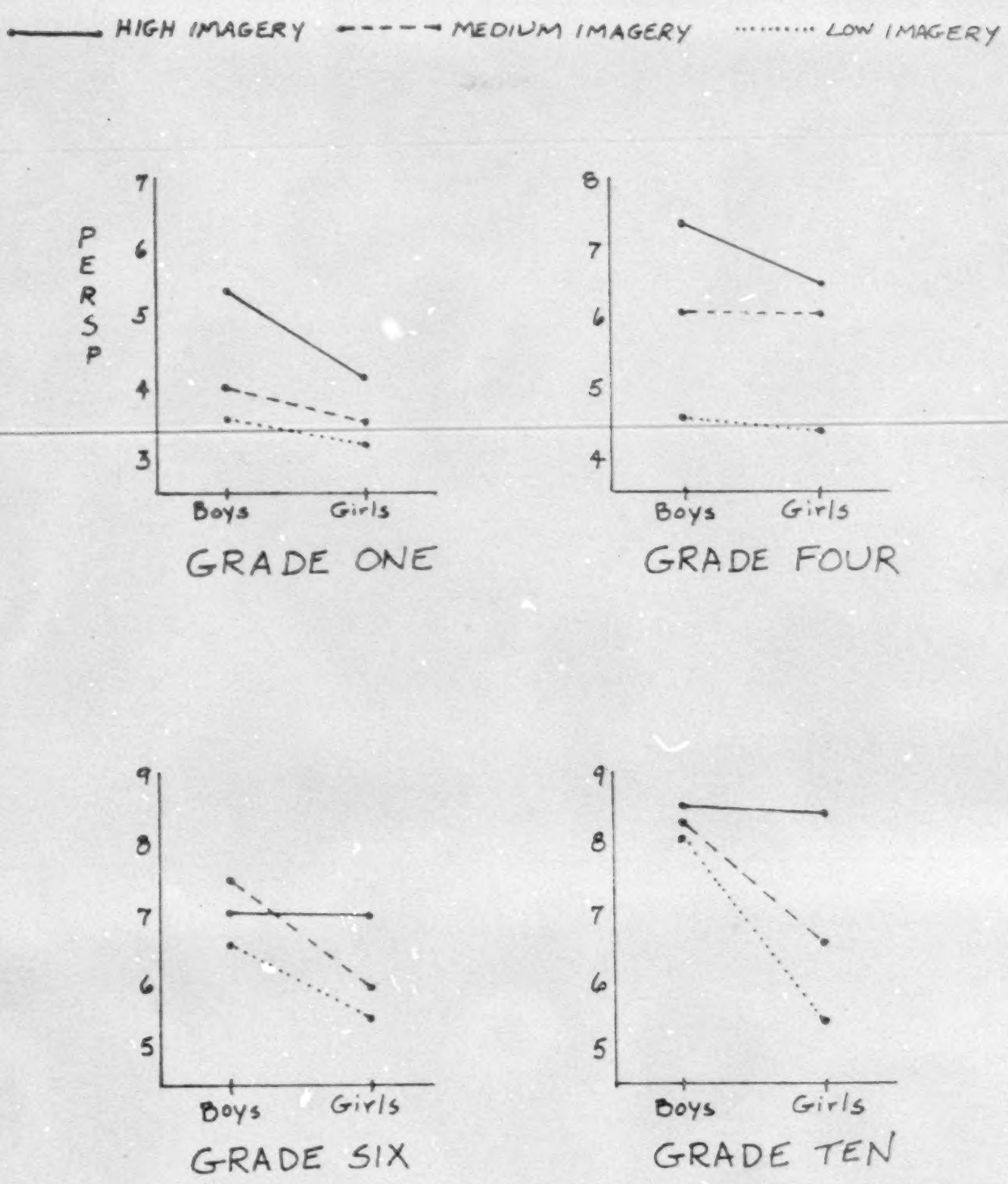


TABLE 1. CORRELATIONS BETWEEN IMAGERY AND PIAGET TASKS.

	GRADE			
	I	IV	VI	X
DISPLACEMENT	-.06	.47***	.21	.69***
PENDULUM	.09	.49***	.25	.38**
PERSPECTIVES	.35*	.60***	.39**	.63***

* $p < .05$
** $p < .01$
*** $p < .001$